

What is claimed is:

[Claim 1] A lifting and holding apparatus wherein said apparatus comprises an individual lifting tower, said lifting tower comprising:

- a) base having ground traversing means;
- b) upright support member comprising an elongated and torsionally stiff member extending in a generally vertical direction from said base;
- c) carriage associated with said upright support member, said carriage being slidably mounted to said upright support member thus permitting movement of said carriage along the longitudinal length of said upright support member;
- d) load supporting assembly having means of attachment to said carriage;
- e) pulley mechanism associated with said upright support member and located upwards of said carriage and wherein said pulley mechanism includes a main body and a cable engaging pulley freely rotatably connected thereto;
- f) lifting means for selectively effecting the elevation of said carriage relative to said base wherein said lifting means comprises a cable pulling device, said cable pulling device including a main body and a spool;
- g) cable associated with said cable pulling device, said cable having two tails;
- h) one or more crossmembers wherein each crossmember comprises an elongated and torsionally stiff member.

[Claim 2] Lifting and holding apparatus in accordance with claim 1, wherein:

- a) at least one of said crossmembers extends in a generally horizontal direction from said base;

- b) said base is provided with means of connecting said horizontal crossmember thereto, said base further including a mounting point for attachment of said cable pulling device, said cable pulling device being attached to said mounting site;
- c) said carriage includes a mounting point for attachment of a cable engaging pulley device.

[Claim 3] Lifting and holding apparatus in accordance with claim 2, including:

- a) one or more diagonally disposed support members oriented substantially in a vertically direction, each having an upper end and a lower end, each upper end having means of attachment to said upright support member and each lower end having means of attachment to said horizontal crossmember;
- b) a cable engaging pulley device attached to said mounting point on said carriage.

[Claim 4] Lifting and holding apparatus in accordance with claim 3, wherein;

- a) said carriage includes a main body forming a circumferential sleeve slidably mounted surrounding a segment of said upright support member, said main body having inner dimension and longitudinal length in proportional relationship with the outer dimension of said upright support member such that the values of said inner dimension and said outer dimension differ by no more than .75 percent of said longitudinal length of said sleeve;
- b) said carriage further includes means for securing said carriage into a fixed position relative to said upright support member;

- c) said pulley mechanism further comprises a locking means disposed adjacent said pulley wherein a cable passing through said locking means is prevented from movement relative to said pulley mechanism;
- d) one tail of said cable is attached to said main body of said cable pulling device and the second tail of said cable extending around said pulley of the pulley mechanism and extending around said cable engaging pulley device and passing through said locking means of the pulley mechanism is connected to said spool of said cable pulling device.

[Claim 5] Lifting and holding apparatus in accordance with claim 4, wherein;

- a) said mounting site on said base for said cable pulling device has location such that an axis defined by the segment of said cable extending between said main body of the cable pulling device and said pulley of the pulley mechanism and the longitudinal axis of said upright support member intersecting therewith forms an angle of at least 4 degrees and not more than 9 degrees;
- b) said mounting point on said carriage for said cable engaging pulley device has location such that an axis defined by the segment of said cable extending between said cable engaging pulley device and said pulley of the pulley mechanism and the longitudinal axis of said upright support member intersecting therewith forms an angle of at least 2 degrees and not more than 17 degrees.

[Claim 6] Lifting and holding apparatus in accordance with claim 5, wherein;

said locking means of said pulley mechanism comprises:

- a) a pair of opposed protrusions extending from said main body to define a channel therewithin, said pair of opposed protrusions being defined as sides of said channel, and said channel being capable of receiving a cable therein;

b) a threaded aperture passing through on one of said sides and a mating bolt extending inwardly therethrough being positionable to permit contact with said cable thus permitting said bolt to be positioned to prevent movement of said cable relative to said locking means.

[Claim 7] Lifting and holding apparatus in accordance with claim 5, wherein;

said locking means of said pulley mechanism comprises:

- a) a threaded aperture passing through said main body to permit a mating bolt to extend inwardly therethrough, said mating bolt being positionable within said threaded aperture;
- b) said main body having an first portion comprising a pair of opposed protrusions extending therefrom to define a channel therewithin, said channel extending in a direction in perpendicular relationship to said threaded aperture and disposed adjacent said threaded aperture, and said channel being capable of receiving a cable therein;
- c) an aperture passing through one of said pair of opposed protrusions of said first portion wherein said pair of opposed protrusions are defined as sides of said channel;
- d) said main body having an second portion disposed adjacent said first portion, said second portion having a protrusion extending inwardly through said aperture in said first portion to permit contact with said cable, and wherein said mating bolt is positively rotatably engaged within said threaded aperture to cause said cable to be locked into a fixed position relative to said pulley mechanism and wherein said bolt is negatively rotatably engaged within said threaded aperture to cause said cable to be released from a fixed position relative to said pulley mechanism.

[Claim 8] Lifting and holding apparatus in accordance with claim 1, wherein;

each of said (a) through (h) is an individually separate component and wherein;

- i) said upright support member is detachably connected to said base;

- ii) said carriage is detachably mounted to said upright support member;
- iii) said load supporting assembly is detachably attached to said carriage;
- iv) said pulley mechanism is detachably connected to said upright support member;
- v) said cable pulling device is detachably attached to said base.

[Claim 9] Lifting and holding apparatus in accordance with claim 8 and method of assembly wherein;

each of said individual components are brought into cooperation to form a lifting and holding apparatus, and wherein the method includes:

- a) the step of connecting said upright support member to said base;
- b) the step of mounting said carriage to said upright support member;
- c) the step of attaching said load supporting assembly to said carriage;
- d) the step of connecting said pulley mechanism to said upright support member;
- e) the step of attaching said cable pulling device to said base;
- f) the step of connecting one of said tails of said cable to said spool of the cable pulling device and attaching the second tail of said cable to said main body of said cable pulling device.

[Claim 10] A lifting and holding apparatus and method of assembly wherein said apparatus comprises one or more pair of individual lifting towers and wherein two or more crossmembers interconnect the two lifting towers of each pair, each of said lifting towers comprising:

- a) base having ground traversing means;
- b) upright support member comprising an elongated and torsionally stiff member extending in a generally vertical direction from said base;
- c) carriage associated with said upright support member, said carriage being slidably mounted to said upright support member thus permitting movement of said carriage along the longitudinal length of said upright support member, said carriage further including a mounting point for attachment of a cable engaging pulley device;

- d) load supporting assembly having means of attachment to said carriage;
- e) pulley mechanism associated with said upright support member and located upwards of said carriage and wherein said pulley mechanism includes a main body and a cable engaging pulley freely rotatably connected thereto;
- f) lifting means for selectively effecting the elevation of said carriage relative to said base wherein said lifting means comprises a cable pulling device, said cable pulling device including a main body and a spool;
- g) cable associated with said cable pulling device, said cable having two tails;
- h) one or more crossmembers wherein each crossmember comprises an elongated and torsionally stiff member extending in a generally horizontal direction from said base.

[Claim 11] Lifting and holding apparatus in accordance with claim 10, wherein;

- a) at least one torsionally stiff member disposed in a generally horizontal direction interconnects said base of the first lifting tower of each pair with said base of the second lifting tower of each pair, said lower horizontal crossmember being detachably connected to each base;
- b) a torsionally stiff member interconnects said carriage of the first lifting tower of each pair with said carriage of the second lifting tower of each pair, said upper horizontal crossmember being detachably connected to each carriage.

[Claim 12] Lifting and holding apparatus in accordance with claim 11, wherein;

- a) said load supporting assembly includes at least one body attachment arm having means of attachment to said load supporting assembly, said arm being provided with a protrusion shaped to allow insertion within a channel existing between a vehicle body and the frame of said vehicle, said vehicle body having a pre-existing attachment site adjacent said channel, said attachment site comprising a threaded aperture and mating bolt;

b) said arm is further provided with means for securing to said attachment site, said means comprising an elongated aperture passing through said projection to permit said mating bolt to extend inwardly therethrough whereby said mating bolt extending inwardly through said elongated aperture and extending inwardly through said threaded aperture secures said arm to said vehicle body when said mating bolt is positively engaged within said threaded aperture.

[Claim 13] Lifting apparatus in accordance with claim 11, including:

- a) one or more diagonally disposed support members oriented substantially in a vertically direction, each having an upper end and a lower end, each upper end having means of attachment to said upright support member and each lower end having means of attachment to said horizontal crossmember;
- b) a cable engaging pulley device attached to said mounting point on said carriage.

[Claim 14] Lifting apparatus in accordance with claim 13, wherein;

- a) said carriage includes a main body forming a circumferential sleeve slidably mounted surrounding a segment of said upright support member, said main body having inner dimension and longitudinal length in proportional relationship with the outer dimension of said upright support member such that the values of said inner dimension and said outer dimension differ by no more than .75 percent of said longitudinal length of said sleeve;
- b) said carriage further includes means for securing said carriage into a fixed position relative to said upright support member;
- c) said pulley mechanism further comprises a locking means disposed adjacent said pulley wherein said cable passing through said locking means is prevented from movement relative to said pulley mechanism;

- d) said base is provided with means of connecting said horizontal crossmember thereto, said base further including a mounting point for attachment of said cable pulling device, said cable pulling device being attached to said mounting point;
- e) one tail of said cable is attached to said main body of said cable pulling device and the second tail of said cable extending around said pulley of the pulley mechanism and extending around said cable engaging pulley device and passing through said locking means of the pulley mechanism is connected to said spool of said cable pulling device.

[Claim 15] Lifting and holding apparatus in accordance with claim 14, wherein;

- a) said mounting site on said base for said cable pulling device has location such that an axis defined by the segment of said cable extending between said main body of the cable pulling device and said pulley of the pulley mechanism and the longitudinal axis of said upright support member intersecting therewith forms an angle of at least 4 degrees and not more than 9 degrees;
- b) said mounting point on said carriage for said cable engaging pulley device has location such that an axis defined by the segment of said cable extending between said cable engaging pulley device and said pulley of the pulley mechanism and the longitudinal axis of said upright support member intersecting therewith forms an angle of at least 2 degrees and not more than 17 degrees;
- c) said means for securing said carriage into a fixed position relative to said upright support member comprises a threaded aperture passing through said carriage for receiving a mating bolt, and wherein said mating bolt is positively engaged within said threaded aperture to cause said bolt to lock said carriage into a fixed position relative to said upright support member and wherein said bolt is negatively engaged to cause said bolt to release said carriage.

[Claim 16] Lifting and holding apparatus in accordance with claim 15, wherein;

said base resides on two or more wheels, said wheels having location such that an axis defined by the longitudinal direction of said upright support member connected to said base differs from a true vertical axis and intersecting therewith forms an angle of not more than 3 degrees and not less than .5 degrees.

[Claim 17] Lifting and holding apparatus in accordance with claim 14, wherein;

said locking means of said pulley mechanism comprises:

- a) a threaded aperture passing through said main body to permit a mating bolt to extend inwardly therethrough, said mating bolt being positionable within said threaded aperture;
- b) said main body having an first portion comprising a pair of opposed protrusions extending therefrom to define a channel therewithin, said channel extending in a direction in perpendicular relationship to said threaded aperture and disposed adjacent said threaded aperture, and said channel being capable of receiving a cable therein;
- c) an aperture passing through one of said pair of opposed protrusions of said first portion wherein said pair of opposed protrusions are defined as sides of said channel;
- d) said main body having an second portion disposed adjacent said first portion, said second portion having a protrusion extending inwardly through said aperture in said first portion to permit contact with said cable, and wherein said mating bolt is positively rotatably engaged within said threaded aperture to cause said cable to be locked into a fixed position relative to said pulley mechanism and wherein said bolt is negatively rotatably engaged within

said threaded aperture to cause said cable to be released from a fixed position relative to said pulley mechanism.

[Claim 18] Lifting and holding apparatus in accordance with claim 10, wherein;

each of said (a) through (h) is an individually separate component and wherein;

- i) said upright support member is detachably connected to said base;
- ii) said carriage is detachably mounted to said upright support member;
- iii) said load supporting assembly is detachably attached to said carriage;
- iv) said pulley mechanism is detachably connected to said upright support member;
- v) said cable pulling device is detachably attached to said base.

[Claim 19] Lifting and holding apparatus in accordance with claim 11 and method of assembly wherein;

each of said individual components are brought into cooperation to form a lifting and holding apparatus, and wherein the method includes:

- a) the step of connecting said upright support member to said base;
- b) the step of mounting said carriage to said upright support member;
- c) the step of attaching said load supporting assembly to said carriage;
- d) the step of connecting said pulley mechanism to said upright support member;
- e) the step of attaching said cable pulling device to said base;
- f) the step of connecting one of said tails of said cable to said spool of the cable pulling device and attaching the second tail of said cable to said main body of said cable pulling device;
- g) the step of positioning each lifting tower assembly adjacent the load to be lifted;
- h) the step of connecting said lower horizontal crossmember to the base of both lifting towers that form a pair.

[Claim 20] Lifting and holding apparatus in accordance with claim 12 and method of assembly wherein the method includes:

- a) the step of positioning each lifting tower assembly adjacent the vehicle body to be lifted;
- b) the step of attaching each load attachment arm to an attachment site on said vehicle body;
- c) the step of attaching each load attachment arm to a load supporting assembly;
- d) the step of connecting said lower horizontal crossmember to the base of both lifting towers that form a pair;
- e) the step of separating said vehicle body from its frame and elevating said vehicle body;
- f) the step of connecting said upper horizontal crossmember to the carriage of both lifting towers that form a pair;
- g) the step of disconnecting said lower horizontal crossmember from the base of both lifting towers that form a pair;
- h) the step of removing said vehicle frame from beneath the elevated vehicle body;
- i) the step of reconnecting said lower horizontal crossmember to the base of both lifting towers that form a pair.